OBSERVATIONS ON BELUGA WHALES TRAPPED BY ICE IN ESKIMO LAKES WINTER 1966/67

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Inuvik Research Laboratory Report

R.M. Hill
27 November 1967

OBSERVATIONS ON BELUGA WHALES TRAPPED BY ICE IN ESKIMO LAKES WINTER 1966/67

Introduction

Early in the winter of 1966/67 a number of beluga whales (Delphinapterus leucas) were trapped by ice in the Eskimo Lakes at a point 30 miles northeast of Inuvik, Northwest Territories. Observations were made on the whales by the staff of the Inuvik Research Laboratory from the time they were first sighted in August until their breathing hole closed over at the end of January.

The beluga whale is a dolphin like Cetacean measuring 5 feet to 17 feet in length and weighing up to 2,500 pounds. They have rounded heads and a ridge in place of a back fin. Their colour is dark grey when young, which gradually changes to a mottled yellow and finally pure white when adult. Beluga whales have a highly developed social behaviour and they are reported to produce a wide range of sounds.

The beluga whales are common in the Beaufort Sea and are often seen in the summer from the Amundsen Gulf through to the Mackenzie Bay. The whales concentrate in the Mackenzie Delta area from mid-July to mid-August where they are hunted in the relatively shallow waters with rifles and harpoons from canoes and small boats. Each year 100 to 200 whales are taken by hunters working mainly from Tuktoyaktuk and Kendall Island.

At least 50 beluga whales were observed early in August in the 4th Eskimo Lake, which connects to the Arctic Ocean 150 miles away through a labyrinth of lakes, islands and peninsulas (see

10412

map). Although beluga are often sighted in the Liverpool Bay area and sometimes in the first three Eskimo Lakes, they are seldom observed in the 4th Eskimo Lake. The whales observed in the 4th Eskimo Lake probably followed a school of herring into the lake and either could not find their way out or were satisfied with the food supply in the area when ice covered over the narrows leading into the lake.

As the fate of beluga whales trapped by ice had not been fully documented before, and, as the location was close to Inuvik, an observation program was initiated by the staff of the Inuvik Research Laboratory to document more about the winter activities and the predicament of the trapped whales. Extensive use was made of field parties working in the area and pilots flying between Inuvik and Tuktoyaktuk to provide data as specific funds were not available for the observation program. Fifteen flights were made by Laboratory staff members to the whale site but only three flights, costing less than $100 in total, were charged to the project.

The whale observation program was set up to record data without disturbing the whales and without interfering in the hunting of the whales by local natives as permitted by the Department of Fisheries regulations. There was considerable discussion and some feelings between groups such as the Inuvik Lions Club 'save-the-whale' committee and others who proposed that the whales be slaughtered for local consumption. However, the whales were not disturbed by hunters as, presumably, it was not worthwhile for Tuktoyaktuk residents to come 60 miles overland

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to take the whales when their ice cellars were already full from a successful summer of whaling.

The whale observation program, which was discussed with members of the Arctic Unit of the Fisheries Research Board, included measurement of the hole size, number of whales, temperatures, ice thickness and whale activity. In addition data was collected on total surfacings and duration of dives for specific whales. Underwater noises of the whales were picked up on a tape recorder and an attempt was made to follow the whales with a depth sounder. The observations are briefly presented in the following section.

Observations

Unless noted the observations listed were made by the staff of the Inuvik Research Laboratory. Measurements given for the whale holes in the ice are for the maximum length and maximum width. The holes were irregular ovals usually with one end wider than the other.

Aug 20 to Sept 23	- several sightings over a period of 4 weeks by Geological Survey of Canada field party under Dr. John Fyles which was working in the area of the 4th Eskimo Lake. Usually 2 or 3 whales were seen at each sighting but numerous sightings would be made on each reconnaissance flight.
Sept 20	- Herb Bachor, Reindeer Air Services pilot reported larger groupings of whales and estimated at least fifty whales were in the 4th Eskimo Lake.
Oct 3	- ice forming on the bays in the 4th Eskimo Lake. - several whales sighted by Mike Zubko, Aklavik Flying Service pilot.
Oct 3 to Oct 31	- many sightings reported by passengers and pilots en route between Inuvik and Tuktoyaktuk. Ice forming over entire 4th Eskimo Lake.

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Oct 3 to Oct 31 - many sightings reported by passengers and pilots on route between Inuvik and Tuktoyaktuk. Ice forming over entire 4th Eskimo Lake.

Nov 1 - 3 holes remaining in entire 4th Eskimo Lake with numerous sightings of the whales in these holes. Largest hole approximately 500' in diameter with other two holes approximately 50' in diameter. The large hole was located at 133°20'W X 68°46'N off a point of land on the west shore, which was to become known as Beluga Point. The two smaller holes were around a mile away and fairly close to the east shore.

Nov 8 - largest of 3 holes down to 50' in diameter with smaller holes down to approximately 5' X 25'. Air temperatures in the area were reported down to as low as -30°F.

Nov 10
- first small aircraft landing made on the ice close to the whale holes.
- largest hole was approximately 50' in diameter while the smaller holes were approximately 6' X 30'.
- as many as 10 whales were seen at one time in the largest hole and 4 or 5 whales were seen at one time in the two smaller holes.
- the number of whales was estimated at 20 with a possibility that there were as few as 15.
- the ice was 5 inches thick 10 feet back from the hole and was 22 inches thick 50 feet back from the hole.
- all the whales appeared to be in good condition although 2 of the larger whales had pronounced backbones showing. Several of the adult whales had extensive rust coloured fungus-like spots on them.

Nov. 11
- largest hole measured 25' X 45'.
- water: temperature 36°F. pH 7.9, Sp. Gr. 1.000, chloride 1395 ppm.
- water did not taste salty and could be considered fresh.
- water depth under largest hole 250' off shore was 110'.

Nov 17
- largest hole measured 25' X 45'; two smaller holes closed over.
- water 36°F. ice 9 inches thick 10 feet back from hole.
- as many as 12 whales seen at one time. Appeared to be 3 young whales, 6 nine foot whales, 4 ten foot whales, 3 large whales 14 to 15 feet, and 1 giant whale around 17 feet long giving a total of 17 whales.
- number of surfacings per minute was observed for one hour giving an average of 19, maximum of 37, and minimum of 9.

Nov 1 - 3 holes remaining in entire 4th Eskimo lake with numerous sightings of the whales in these holes. Largest hole approximately 50' in diameter with other the holes approximately 50' in diameter. The large hole was located at 73°20'W x 56°50'N off a point of land on the east shore, which was to become known as Beluga Point. The two smaller holes were around a mile away and fairly close to the east shore.

Nov 8 - Largest of 3 holes down to 50' in diameter with smaller holes down to approximately 5' x 25'. Air temperatures in the area were reported down to as low as -30°F.

Nov 10 - First small aircraft landing made on the ice close to the whale holes.
- Largest hole was approximately 50' in diameter while the smaller holes were approximately 6' x 30'.
- As many as 10 whales were seen at one time in the largest hole and 4 or 5 whales were seen at one time in the two smaller holes.
- The number of whales was estimated at 20 with a possibility that there were as few as 15.
- The ice was 5 inches thick 10 feet back from the hole and was 32 inches thick 50 feet back from the hole.
- All the whales appeared to be in good condition although 2 of the largest whales had pronounced backbone showing. Several of the adult whales had extensive rust coloured fungus-like spots on them.

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- Water 36°F. ice 9 inches thick 10 feet back from hole.
- As many as 12 whales seen at one time. Appeared to be 3 young whales, 6 nine foot whales, 4 ten foot whales, 3 large whales 14 to 15 feet, and 1 giant whale around 17 feet long giving a total of 17 whales.
- Number of surfacings per minute was observed for one hour giving an average of 10, maximum of 32, and minimum of 9.

Nov 17 - one adult and a young whale were observed to always surface together.

Nov 23 - hole measured 22' X 42'; ice 3" to 7" thick along edge of hole.
- two large adults were observed for a total of 56 minutes during which time they made 10 dives lasting more than two minutes with the longest dive lasting 7 minutes, 25 seconds.
- total surfacings in the hole were observed for 23 minutes.
- whales appeared to take around 5 to 6 rapid breathes and then dive for an extended period of 3 to 5 minutes.

Dec 2 - hole 3' X 35'.
- air temperature as low as -40°F with 20 m.p.h. wind.
- only 3 whales sighted during brief 5 minute observation.

Dec 5 - hole 5' X 35'.

Dec 9 - hole 1½' X 17', wind 16 m.p.h., air -22°F, water 38°F.
- ice 2'8" twenty feet back from hole and 3'6" fifty feet back from hole.
- estimate of only 12 whales.

Dec 12 - hole 4½' X 35', nil wind, air -20°F., water 37°F.
- ice thickness 2' twenty feet from hole.

Dec 14 - hole 4½' X 30', 6 m.p.h. wind, air -15°F, water 36°F.
- ice thickness 2'10" twenty feet from hole
- number of whales estimated at 12.

Dec 21 - hole reported by GNA pilot at 2½' X 10'.

Dec 23 - hole 10' X 35' (fish shaped), nil wind, air -5°F., water 36°F.
- ice thickness 2'2" ten feet from hole, 2'10" twenty feet from hole and 3'10" seventy feet from hole.
- it was observed that the entire hole had moved around 40 feet in a southeasterly direction from when the hole was first visited on November 10th.
- estimate of only 7 whales present with the surviving whales appearing to be in as good a body condition as when initially observed.

Dec 26 - Lions Club work party took out two Otter loads of equipment, cut hole to 20' X 40' and hired two men to stay with the whales to keep the hole open.

Dec 30 - hole 18' X 32'; maintained this size by Lions Club workers.

Dec 30
- 3 m.p.h. wind, air 0°F., water 36°F.
- five whales observed; one of them a young grey whale.
- Lions Club workers reported two young grey whales sighted on Dec 29th.
- combination ice and canvas windbreak had been erected around hole.
- tape recording of underwater noises made with microphone 6" below surface.
- depth sounder utilized to follow whale movements but only a few blips observed.
- underwater observation port (glass bottomed box) utilized for observations but not enough light for effective viewing.

Jan 4
- hole 15' X 28'; maintained this size by Lions Club workers.
- 4 m.p.h. wind, air -14°F, water 36°F, ice 40" thick 100 yds from hole.
- only 3 whales observed (two adult 10' and 12' plus one young 10').
- all three whales would be away from the hole for 4-5 minutes and then return together to make several surfacings in rapid succession.
- tape recording made of underwater sounds with microphone 4' below surface to minimize surface noises. Only a few whale "squeaks" obtained in one hour of recording.
- Lions Club workers made a new 4' X 12' hole 100 yards south of the main hole and 20 yards from shore. The ice was 40" thick here and no whales were noticed in or near this hole.

Jan 13
- hole 18' X 20'; frame and canvas cover erected over hole by Lions Club.
- wind 6 m.p.h., air -6°F., water 36°F.
- water sample taken from 110' bottom which had 1555 ppm chloride.
- depth under Lions Club hole 200 yd North was 65' and 100 yd South was 16'.

Jan 21
- CBC crew out to tape underwater whale sounds.
- observed one whale as setting up equipment and then ran approximately 8 minutes on the remainder of one reel plus 32 minutes on a new reel before the whale reappeared giving at least 40 minutes away from the hole.

Jan 26
- after a cold snap with temperatures down to -45°F. a severe storm with winds up to 28 m.p.h. and drifting snow hit the area.
- during this storm the hole froze over completely.

Discussion

No written records were found to indicate that beluga whales had been trapped by ice before in the Eskimo Lakes or the Mackenzie Delta area. However, there are several verbal accounts of whales being trapped some time ago in the 1st Eskimo Lake and on the west side of the Mackenzie Delta. Apparently it is fairly common for large numbers of beluga whales to be trapped by the ice in the Eastern Arctic.

Ice started to form on the 4th Eskimo Lake early in October covering the bays and the only outlet to the Arctic Ocean. The area of open water decreased rapidly and on November 1st the largest open water area was only 500 feet in diameter. Despite all the water movement caused by the whales' continuous surfacing, this opening was only 50 feet in diameter on November 10th. Two smaller holes, one mile from the main hole, closed completely around November 15th with temperatures as low as -30°F.

The main breathing hole was 250 feet offshore with a depth of 110 feet. The water temperatures remained around 36°F during the observations and had a pH of 7.9. The surface water contained 1395 ppm chloride while the bottom water contained 1555 ppm chloride. It did not taste salty and could be considered as fresh since normal sea water contains 35,000 ppm chloride. The lake ice thickness was 22 inches on November 10th and increased to 40 inches by the end of January. Around the breathing hole the ice was quite a bit thinner due to the water currents set up by the whales. Between November 10th

and December 23rd the entire hole moved around 40 feet in a southeasterly direction.

It was difficult to obtain accurate counts on the trapped beluga whales since individual whales were hard to identify and they were constantly surfacing and diving. However, from the rough estimate of 50 whales during August, their numbers declined steadily to 20 on November 10th, 17 on November 17th, 12 on December 9th, 7 on December 23rd, 5 on December 30th, 3 on January 4th and finally only 1 on January 21st before the hole closed over on January 26th. When light aircraft were first able to land close to the whale hole on November 10th the 20 whales observed were made up of 3 young grey whales around 7 feet long, 7 small adults 10 to 13 feet long, 9 large adults 13 to 15 feet long and 1 very large adult whale around 17 feet long. All of the whales appeared to be in good condition in November although two of them had pronounced back ridges showing. When people were around the hole the whales appeared wary and seemed to stay away as much as possible. Several of the adult whales had extensive rust coloured fungus-like spots or scars on their skin.

Flights to the whales and actual observations were somewhat limited as the sun was below the horizon from December 7th to January 6th and the weather was stormy much of the time. The weather during the period that the whales were trapped by the ice was fairly normal for winter arctic conditions as shown by the following records from the DOT at the Inuvik airport.

Month	September	October	November	December	January
Mean daily temperature °F	40	19	-7	-13	-18
Minimum daily temp.°F	22	-13	-41	-45	-50
Total snowfall, inches	Tr	9.3	5.3	9.9	7.9
Snow on ground at end, in.	0	6	9	16	19
Degree days below 65°F	729	1427	2159	2419	2574

The minimum daily temperatures and maximum daily winds at the Inuvik airport are plotted in Figure 1. The combination of cold temperatures and high winds were the most difficult weather conditions for the whales to keep their breathing holes open. During the storm of December 8th to 10th the whale hole was reduced to only 1½ feet by 17 feet and the whales had to "line up" for surfacing. After a storm the whales were able to make their breathing hole larger by circulating the 36 degree water and actually breaking off overhanging sections of ice with their backs. The combination of high winds up to 18 m.p.h. and falling temperatures on January 26th proved too much for the one remaining whale and the hole closed over. The Eskimo Lakes are not free of ice until July although some parts are open earlier. If the whales had been able to obtain enough food and were able to keep their breathing hole open, they would have had to live through nine difficult months before they could return to their natural habitat in the Arctic Ocean. The trapped beluga whales maintained a normal respiration cycle during their predicament with deep dives of 3 to 5 minutes followed by several rapid surfacings before diving again. The number of surfacings and time away from the breathing hole were

observed several times. However, with the large number of whales using the hole during November and December, it was difficult to take meaningful records of individual breathing patterns. On one day, two large adult whales were observed for several dives with a maximum diving duration of 7 minutes and 25 seconds. Over a period of one hour on November 17th twelve whales surfaced an average of 19 times a minute with a maximum rate of 37 and a minimum rate of 9. These surfacings included several short breaths between extended dives. Later in December and in January a few of the whales in an obviously weakened condition would remain around the hole within a few feet of the surface and would surface every minute or so without taking any deep dives.

On January 21st a CBC crew, in attempting to make a tape recording of underwater whale sounds, observed that one whale stayed away from the breathing hole for at least 40 minutes. The time was verified by the size of the reel on the tape recorder, which ran through completely without the whale returning. There was no other possible breathing hole in the lake and only the slight possibility that the whale had found an air pocket under the ice. This is a significant record for a beluga whale dive as the longest dive previously recorded was only 15 minutes (Slijper, p 127).

Although beluga whales are reported to make a number of audible sounds, which can be heard above the surface, no particular sounds or noises were heard during the observations other than the breathing sound as the whales blew and inhaled air when

they surfaced. An attempt was made to record underwater whale sounds with a tape recorder by wrapping the microphone in a plastic bag and immersing it in the water. There was a considerable wave action on the sides of the hole which made considerable noise and allowed only a few squeaks attributable to the whales to be picked up. Later the use of a larger plastic bag allowed the microphone to be immersed around 3 feet below the surface. This arrangement quietened the noise of the wave action but still only a few high pitch squeaks were picked up. Other attempts to pick up the whale noises by a CBC crew were also virtually useless.

Beluga whales normally eat a variety of fish and bottom living crustaceans. The trapped whales were probably well fed when they could move around in the 4th Eskimo Lake, but as their range became limited to the area of the one breathing hole the 20 whales would undoubtedly consume most of the available food in a short period. Sitidgi Creek, which drains into the 4th Eskimo Lake around 10 miles from Beluga Point, is well known for good trout fishing.

As the beluga usually swim at 7 m.p.h., with a peak speed of 12 m.p.h., and they dive for periods of 5 to 6 minutes, the trapped whales would cover an area in search of food extending from 1/3 to 1/2 mile in diameter from the main hole.

It is unlikely that this area on an arctic lake would be productive enough to support even a few whales for an extended period. The whales probably slowly starved to death as their body reserves were used up, The whales were offered

considerable quantities of food by well wishers, which varied from lamb chops to ground-up fish. However, there was no evidence that any of this unnatural food was touched by the whales. If they had been able to obtain enough food, they probably could have kept their breathing hole open and survived the winter.

The plight of the beluga whales trapped in the Eskimo Lakes attracted international publicity and provided an exciting experience for many Inuvik area residents who visited the whale hole. The data obtained by the observation program has only a minimal scientific value since only visual sightings and timing of dives could be carried out. It would have been much more informative to capture one or more of the whales for an examination of its body condition and stomach contents. If some of the whales could have been captured, it would be the first time that a beluga whale specimen was taken with prior knowledge before the kill. However, with the difficulty of recovering a whale after shooting or harpooning and the "save-the-whale" atmosphere, no attempts were made to obtain specimens.

The lions Club attempt to move the whales to a new feeding area, by cutting a series of breathing holes, was unsuccessful as the whales did not use either of the two holes which were cut for them adjacent to their main breathing hole. During the summer of 1967 several flights were made over the area where the whales were trapped to look for any sign of the whales washed up on the shores. However, no bodies or parts were observed.

That beluga whales could survive being trapped in one fresh water location for four winter months is the main observation. The dive of 40 minutes recorded by the CBC crew is also significant.

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INIMUM TEMPERATURES AND MAXIMUM WINDS OCTOBER 1966 - JANUARY 1967

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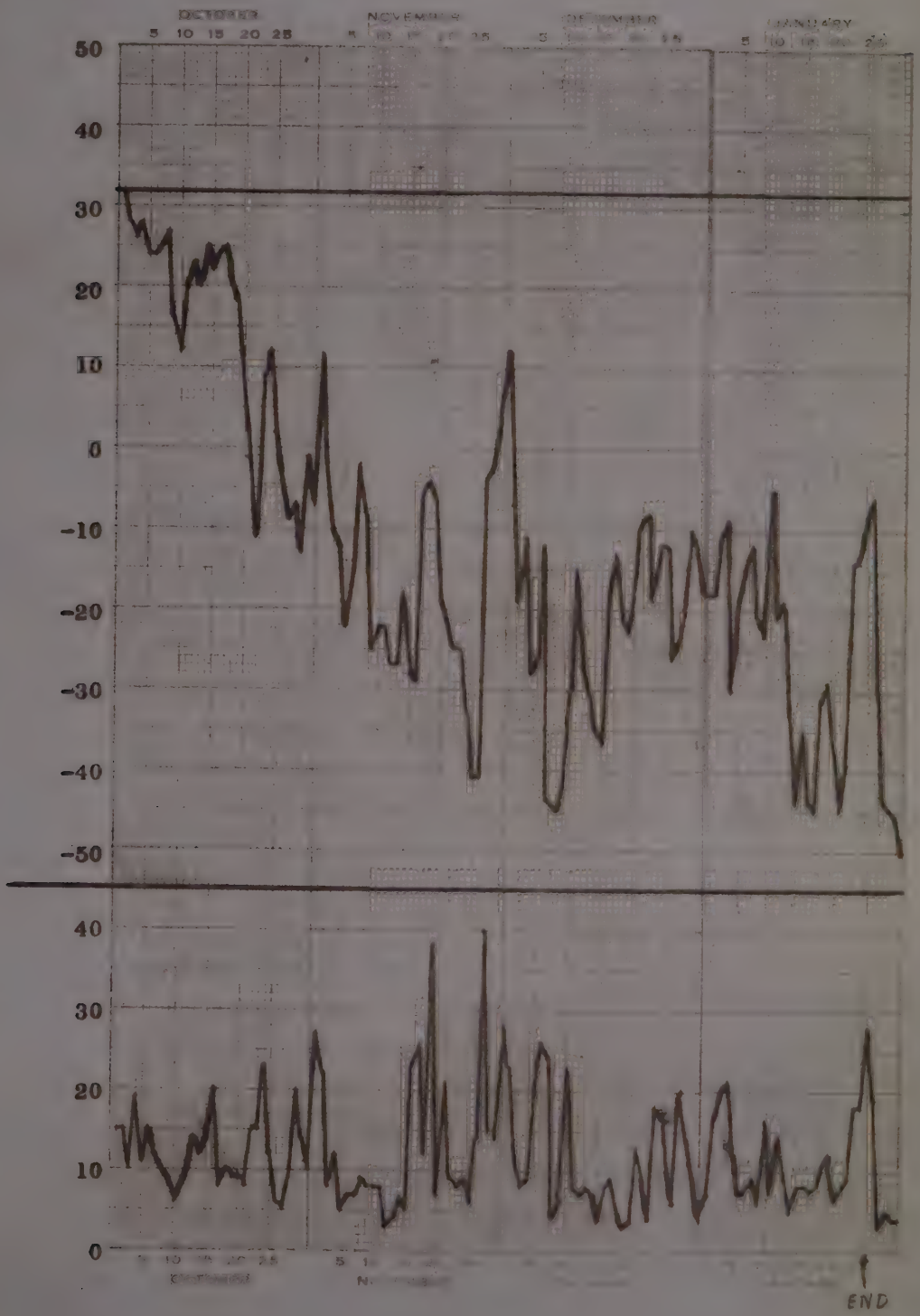
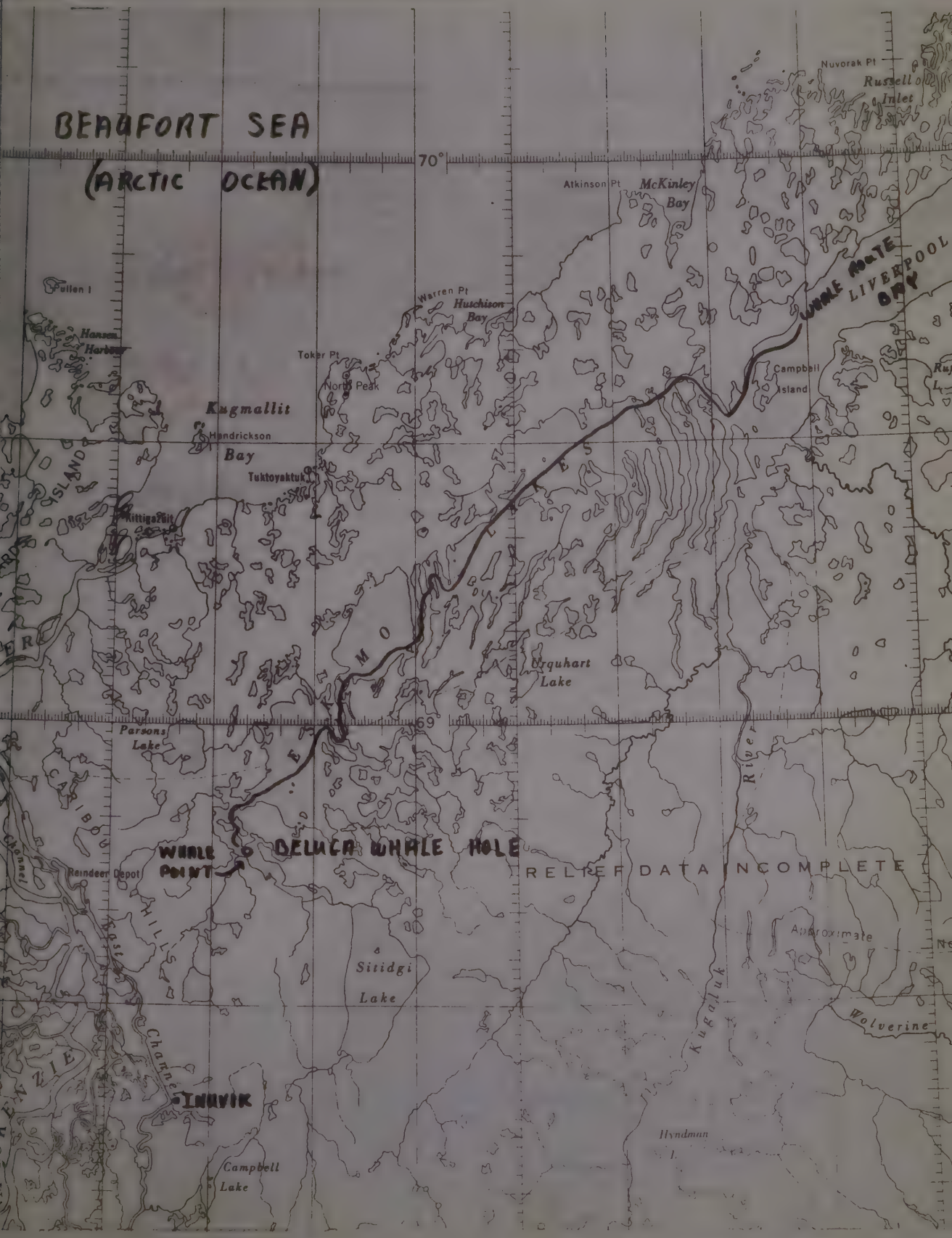


servations on Beluga Whales Trapped
Ice In Eskimo Lakes, Winter 66/67

Inuvik Research Laboratory
R.M. Hill

Showing Loaction of Trapped Beluga Whales



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PHOTOGRAPHS OF BELUGA WHALES TRAPPED BY ICE IN ESKIMO LAKES 1966/67

Photo 66-290, Nov 10 - Beluga Point looking North with main whale hole showing 250 feet off shore and East shore of 4th Eskimo Lake approximately two miles across.

Photo 66-292, Nov 10 - Main whale hole in 4th Eskimo Lake showing six whales surfacing. Hole approximately 50 feet in diameter.

Photo 66-291, Nov 10 - One of two smaller holes close to East shore of 4th Eskimo Lake and one mile east of main hole. Hole measured around 6 feet by 30 feet and shows three whales on the surface.

Photo 66-294, Nov 10 - Close up of main whale hole showing two whales surfacing.

Photo 66-318, Nov 17 - Observation tent and main whale hole.

Photo 66-319, Nov 17 - Observation sign put up by Inuvik Research Laboratory.

Photo 66-320, Nov 17 - Four whales surfacing. Note fungus-like markings on the skin and young whale by adult on right side.

Photo 67-5, Dec 23 - Two whales surfacing with obvious skin markings.

Photo 66-304, Dec 23 - Two whales surfacing.

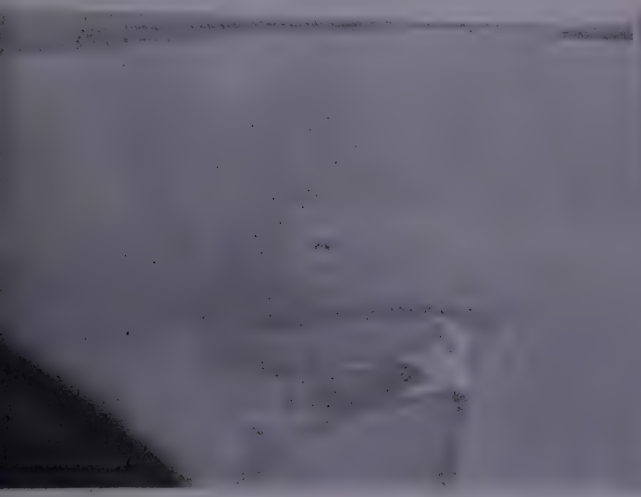
Photo 67-8, Dec 23 - Two whales surfacing. Note sharp back bone.

Photo 67-6, Dec 30 - Main hole with Lions Club canvas and ice windbreak.

Photo 67-7, Dec 30 - Main hole with tape recorder and depth sounder.

All photos taken by R.M. Hill. Photo numbers refer to Inuvik Research Laboratory photo collection.

ELUGA WHALES TRAPPED BY ICE IN ESKIMO LAKES WINTER 66/67 R.M. HILL



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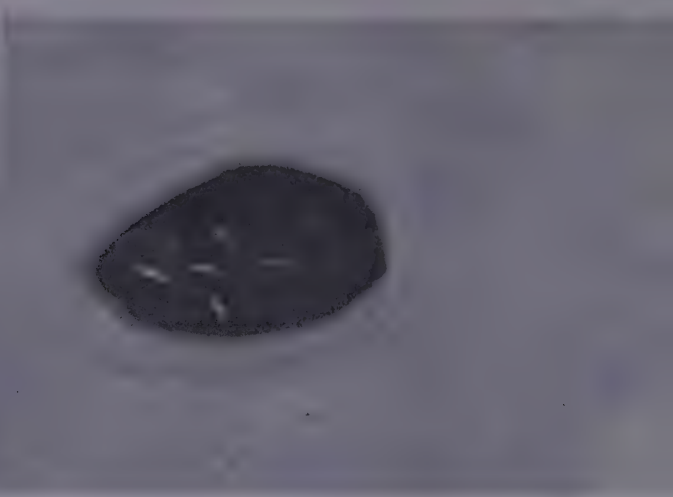

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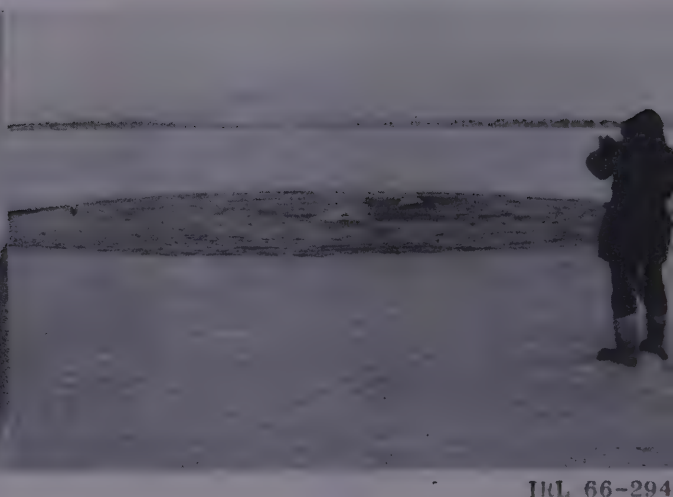

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ELUGA WHALES TRAPPED BY ICE IN ESKIMO LAKES WINTER 66/67

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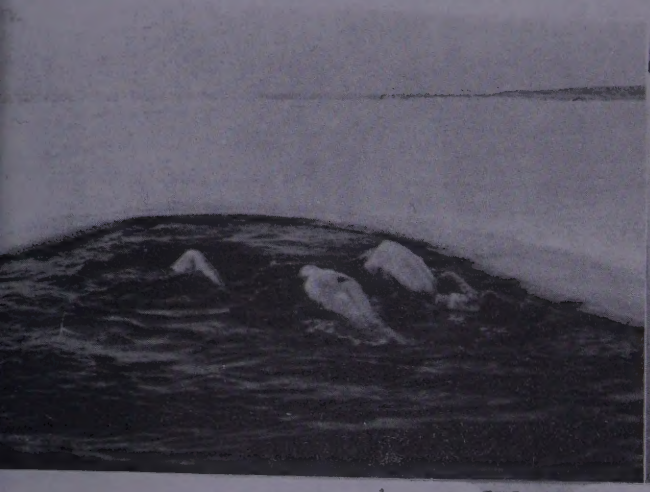

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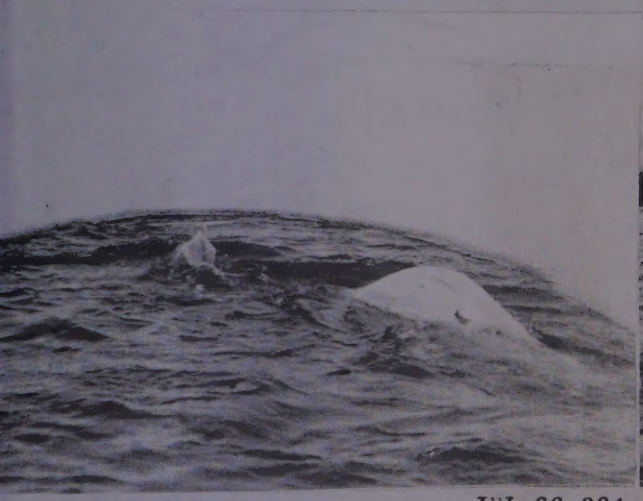

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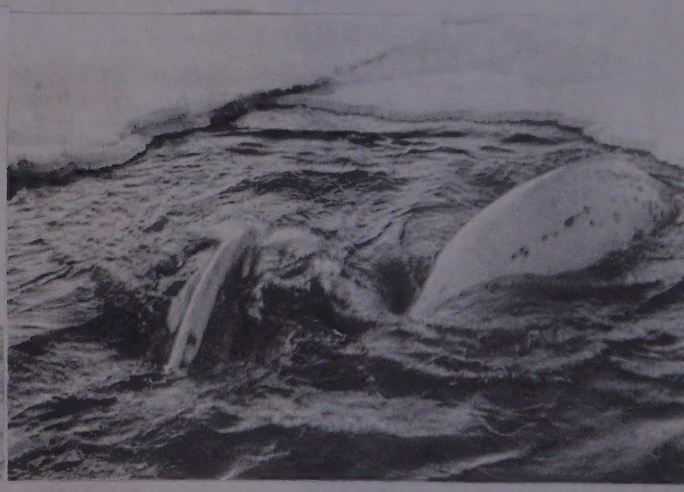

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